



On Model Subtyping

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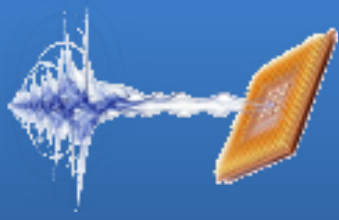
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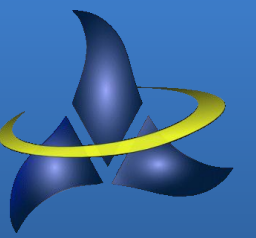
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On Model Subtyping

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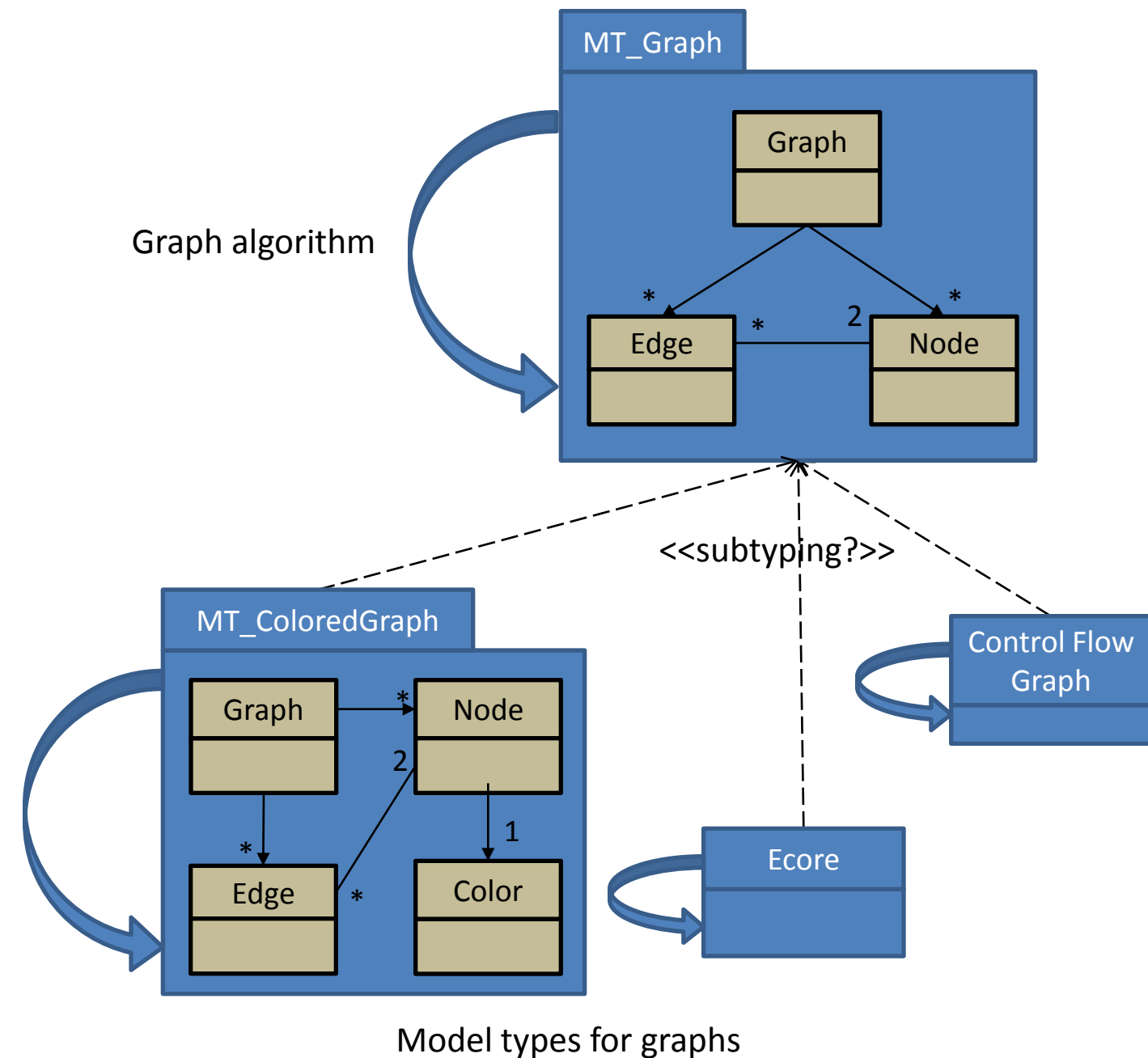
CONTEXT

- Rapid increase of the number of modeling languages
 - More and more model manipulation operators
- Need for a systematic engineering
 - Providing design methods and **facilities** (reuse of operators and structures, advanced tools...)
- Existing approaches remain disconnected from each other
 - Need for a unified theory

MODEL-ORIENTED TYPE SYSTEMS

- Model-oriented type systems should provide facilities such as abstraction, reuse, safety, auto-completion...

A type of a model is a set of types (MOF classes) of objects which may belong to the model, and their relations.

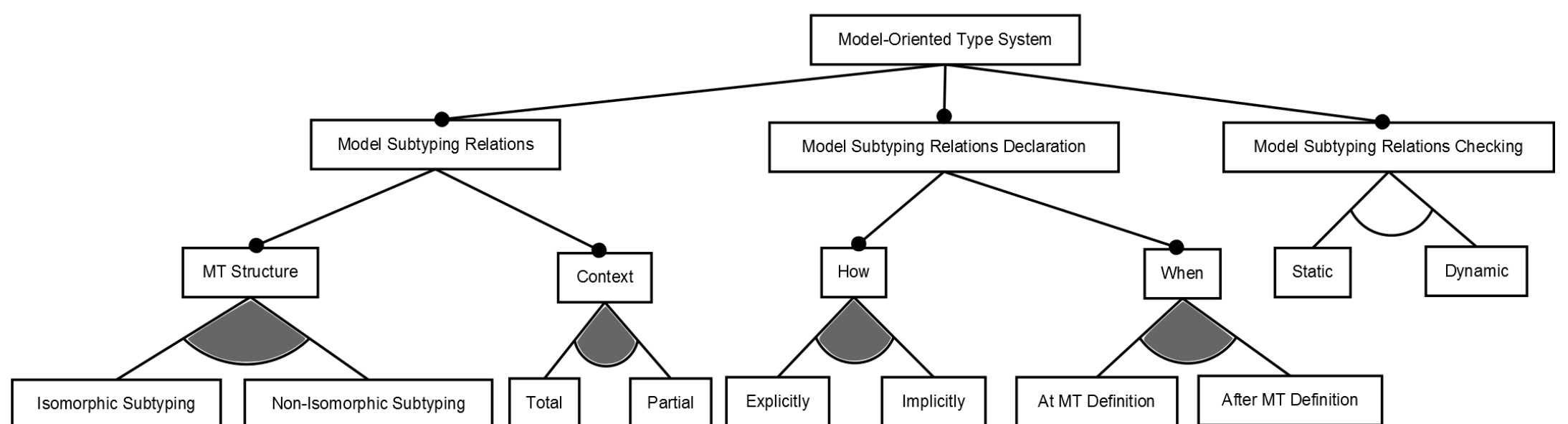
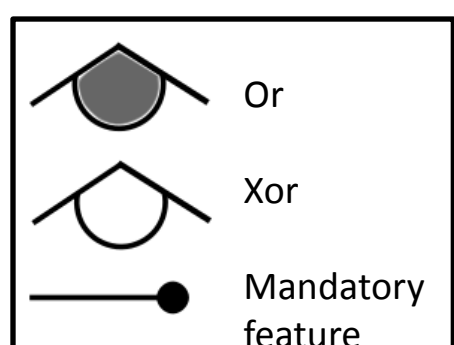


MODEL SUBTYPING RELATIONS

- How can we safely use model typed by A where a model typed by B is expected?
- Structure of the model types
 - Isomorphic subtyping*: **Same** names, multiplicities...
 - Non-isomorphic subtyping*: **Adaptation** from the subtype to its supertype

- Context of the subtyping relation

- Total subtyping*: Models typed by A can be safely used **everywhere** models typed by B are expected
- Partial subtyping*: Models typed by A can be safely used **in a given context** in which models typed by B are expected (e.g., a given model transformation)



A family of model-oriented type systems

| | Total / Partial | Isomorphic/ ~isomorphic | At / After definition | Explicit / Implicit | Checking | Legacy tool reuse |
|--------------------------------|-----------------|---------------------------------------------------------------------------------|----------------------------------------|---------------------|-------------------------------------------|-------------------|
| Varrò <i>et al.</i> | Total | Class renaming | After | Implicit | ? | No |
| Cuccurru <i>et al.</i> | Total | Class renaming | After | Explicit | ? | Yes |
| Steel <i>et al.</i> | Total | Class renaming multiplicities contraction | After | Implicit | At design time, with errors at runtime | Yes |
| Sanchez Cuadrado <i>et al.</i> | Total | Class renaming multiplicities contraction | After | Explicit | ? | Yes |
| Sen <i>et al.</i> | Partial | Any adaptation | After | Explicit | At design time, with errors at runtime | Yes |
| De Lara <i>et al.</i> | Total | Class renaming navigation and filtering of properties, n-to-1 bindings | After (Binding) At (Specialization) | Explicit | ? | No |
| Babau <i>et al.</i> | Total | Isomorphic | After | Explicit | ? | Yes |

Classification of existing approaches for model manipulation reuse

CLASSIFICATION OF EXISTING APPROACHES

- Underused approaches:
 - Partial subtyping (i.e., subtyping wrt. a specific context)
 - Implicit declaration of a subtyping relation
 - Declaration at the definition of a type
 - Isomorphic subtyping (too restrictive)
- Lack of information on subtyping relations checking

PERSPECTIVES

- Could we propose a type system providing each one of those features?